Proceedings of the Iowa Academy of Science

Volume 1 | Part 4, 1893; (1887) - Article 34

1893

The Development of the Auditory Vesicle in Necturus

H. W. Norris

chloroform equal parts, pure chloroform, chloroform with a small per cent of paraffine dissolved, increasing the percentage of paraffine from time to time, using just heat enough to to keep the solution a liquid, "soft" melted parafine, finally "hard" melted paraffine. The time required for the process was sometimes two to three weeks, but with the younger tissue, much less. As will be seen, I followed the ordinary method, but used more time. I am satisfied that many of the so-called insuperable difficulties connected with paraffine infiltration can be overcome by patience and time-serving.

Turpentine, I did not find as satisfactory a reagent as chloroform, probably because the latter will penetrate even if dehydration is not complete. I find alcohol a stisfactory hardening reagent. McClatchie recommends the use of chromic acid in hardening plant tissue. I failed to see its superiority over alcohol.

The staining was done mostly on the slide. Most of the ordinary nuclear stains worked well. The most satisfactory stains all arouud were Czokor's Alum Cochineal for the nucleus, and an alcoholic solution of bismarck brown for the cell wall. When managed properly saffranin gave most beautiful results. Alum-cochineal, borax-carmine, saffranin, haematoxylin, fuchsin, and picro-carmine utterly failed to penetrate the specimens in mass. Orth's lithium-picro-carmine was the only stain that penetrated in mass enough to differentiate the structure of the embryo-sac.

THE DEVELOPMENT OF THE AUDITORY VESICLE IN NECTURUS.

BY H. W. NORRIS.

Owing to the lack of a complete series of embryos, I have been unable to trace the earlier stages of the development of the ear. In all the Amphibia, so far as studied, unless we except the species of Axolotl figured by Houssay, and he was doubtless in error, the ear arises as a differentiation of the inner of the two layers into which the ectoderm is early divided. This inner sensory layer thickens on each side of the head so as to form a small sensory tract, the *anlage* of the ear, closely analogous, if not homologous, in formation to the lateral line sense organs. An ingrowth or inpushing of the thickened ectoderm results in the formation of a pit. The outer layer of indifferent ectoderm takes no share in the formation of the auditory vesicle, but it is slightly involuted into the opening of the pit. The pit deepens, its edges approach each other until the pit becomes a closed vesicle. This description applies to development of the ear of the frog as studied by Villy[1] and of the salamander, Amblystoma, as studied by myself[2].

[1] Development of the Ear and Accessory Organs of the Frog, Quart. Jour. Mic. Sci., No. CXX., 1890.

[2] Development of the Ear of Amblystoma. Jour. Morph., Vol. VII, No. 1, 1892.

The earliest stage that I have as yet found in the development of the ear of Necturus is that shown in Fig. 1. The auditory involution has just begun. In Fig. 2 the growth has proceeded so far that the pit is nearly closed. After the complete differentiation of the vesicle the ear is of a pyriform shape with the apex directed toward the dorsal part of the brain (Fig. 5). The apical portion soon becomes distinctly marked off from the rest of the vesicle as the *recessus labyrinthi* (Fig. 6). In Amblystoma I observed that the dorsal side of the primitive pit was the last to close up, thus giving support to the belief that the recessus of the Amphibian ear is strictly homologous to the recessus of the Elasmobranch ear, in which the primitive connection with the exterior is maintained through life. Just the reverse process is said, by Villy, to occur in the frog. In Necturus I have not satisfactorily decided how the recessus is formed. As the vesicle increases in size the recessus becomes more distinctly marked off, its apex grows dorsally till it lies over and upon the brain. Instead of opening into the dorsal portion of the vesicle its aperture is situated on the median side close to the brain (Figs. 8 and 10). The semi-circular canals are formed in the typical manner. As in Amblystoma the horizontal canal is the first to make its appearance. Folds of the walls of the vesicle grow in so as to imperfectly divide the ear into a number of parts: sacculus, utriculus, semi-circular canals, etc. The beginnings of the processes that result in the differentiation of the various parts of the ear are shown in Figs. 8 and 10.

The later stages have not been studied in detail, owing partly to lack of material. But this much may be stated with certainty: The ear of Necturus in its morphology and ontogeny does not differ in any important respect from that of Amblystoma. Necturus is regarded as representing a more ancestral type than Amblystoma; hence we should expect to find its organs more generalized. But it is usually unsafe to base sweeping comparisons in relationship on the similarities or dissimilarities of single organs. The sense organs connected with the various parts of the ear correspond to those in Amblystoma. But of the existence of the *pars basilaris* I can state nothing. Retzius[3] denies its existence in Proteus, the near relative of Necturus.

The orders of recent Amphibia are three. Each order has its peculiar modification of the membranous part of the ear. The ear of the Caecilians seems to be the most primitive of these, from the research of the Sarasin Brothers[4]. I find in Necturus no vestiges of the peculiarities of the Caecilian ear.

The material on which this paper is based was obtained from Miss Julia B. Platt, of Chicago University.

Explanation of figures and abbreviations used:

Au auditory involution, auditory vesicle, ear; *aug* auditory ganglion; *br* brain; *ca* anterior semi-circular canal; *ch* chorda; *ei* indifferent layer of ectoderm; *ent* entoderm, roof of mouth; *es* sensory layer of ectoderm; *mes* mesoderm; *nr* neural ridge; *opt* eye; *o* aorta; *r* recessus; *sed* dorsal fold of septum of horizontal canal; *sev* ventral fold of septum of horizontal canal.

Figs. 1, 2, 5, 6, 8 and 10 are camera lucida drawings of sections. Figs. 3, 4, 7, 9 and 11 were drawn under the writer's direction from alcoholic material, by Mr. H. G. Willard.

[3]Das Gehororgan der Wirbelthiere. Stockholm, 1881-84.

[4]Ueber das Gehororgan der Caeciliiden, Anat. Anz., Nos. 25 and 26, 1892.

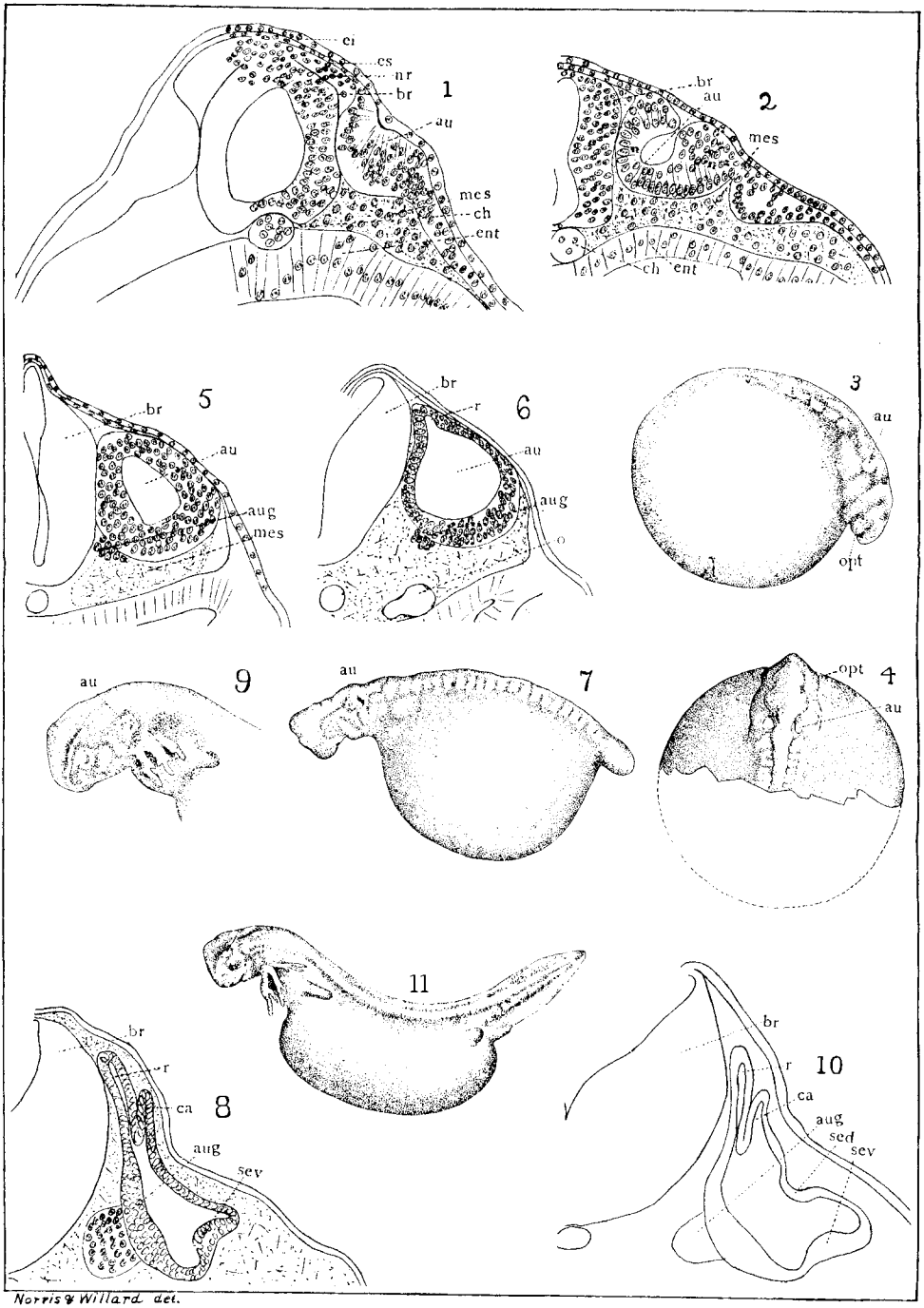
ci
cs
nr
br
1
au
mes
ch
ent
br
au
2
mes
ch
ent
br
5
au
aug
mes
br
r
6
au
aug
3
au
opt
au
9
au
7
opt
4
au
11
br
r
ca
8
aug
sev
br
r
10
ca
aug
sed
sev
Norris & Willard del.

PLATE I.

Fig. 1. Transection of head through auditory region at time auditory involution is just beginning.

Fig. 2. Similar section of embryo of the age of the one shown in Figs. 3 and 4.

Fig. 5. Similar section of somewhat older embryo.

Fig. 6. Similar section of embryo shown in Fig. 7.

Fig. 8. Similar section of embryo shown in Fig. 9.

Fig. 10. Similar section of embryo shown in Fig. 11.

Figs. 1, 2, 5, 6, 8 and 10 are magnified 50 diameters; Figs. 3 and 4 five and one-third diameters; Figs. 7 and 9 four diameters; Fig. 11 three diameters.

AN INSTANCE OF THE PERSISTENCE OF THE DUCTUS VENOSUS IN THE DOMESTIC CAT.

BY H. W. NORRIS.

After injecting with starch-mass through the right femoral vein it was found that the entire arterial system of the cat was filled with starch. Investigation showed the presence of good sized functional ductus venosus through which the arterial and venous systems communicated. The individual possessing this peculiarity was, in life, troubled with what is vulgarly called "fits," whatever that may have been in this particular case. I should be loth to admit any relation between "fits" and the presence of a functional ductus venosus without more extended data.

ADDITIONAL NOTES ON IOWA MOLLUSCA.

BY B. SHIMEK.

About five years ago the writer published an annotated list of Iowa *Mollusca** under the title "*The Mollusca of Eastern Iowa.*" Material has been secured since by which many of the species have been traced across the entire State, and which also throws much additional light on the synonymy of some of the species.

Without an attempt at a thorough and complete revision of the former list a few notes on species heretofore mentioned are presented, and a number of species which have been collected or recognized in the State since the

*Bulletin from the Lab. of Nat. Hist. of the State University of Iowa, Vol. I, No. 1, November, 1888.